



RD-25712
Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : METHOD AND APPARATUS FOR
PRODUCING DIRECTIONALLY
KABLOV ET AL. SOLIDIFIED CASTINGS
Serial No. 09/319,906 Group Art Unit 1722
Filed: 06/14/99 : Examiner: Lin, I.
March , 2003

AMENDMENT UNDER 37 CFR 1.111 AND
PETITION UNDER 37 CFR 1.137(b)

Box DAC – Office of Petitions
Commissioner of Patents
Washington, D.C. 20231

Sir:

In response to the Office communication mailed 10/12/00 please
amend the application as follows:

IN THE DESCRIPTION

Please replace the paragraph beginning at page 2, line 4, with the
following rewritten paragraph:

-- The closest prior art to the embodiments of the present invention is
an apparatus disclosed in French Patent Application 2604378. French
Patent Application 2604378 discloses an apparatus comprising a vacuum
chamber with a heating member inside where there is disposed a ceramic
mold fixed on a water-cooled metallic plate which is moved up and down with
the help of a rod and of an actuator for vertical transportation. A horizontal
baffle separates a heating zone and a cooling zone. In the cooling zone,
concentrically with the chill plate, there is disposed an additional circular

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Jay L. Chaskin

Date March 11, 2003

water-cooled cavity with the inner diameter exceeding the mold's maximal size. Below the cavity there is disposed a container that is utilized for capturing the poured casting metal in the event of mold breakage. --

Please replace the paragraph beginning at page 2, line 16, with the following rewritten paragraph:

-- The above apparatuses, including the apparatus of French Patent Application 2604378, can function only when they comprise a crystallizer. It is impossible to use such installation for directional solidification processing with a liquid metal coolant and it is difficult to utilize the expensive alloys used in directional solidification castings in the event of mold breakage. Thus there is a need for a casting apparatus that provides a means that efficiently cools the molten cast alloy while protecting the equipment from damage in the event that the ceramic mold breaks while containing the molten cast alloy material. --

Please replace the paragraph beginning at page 3, line 3, with the following rewritten paragraph:

-- An embodiment of the apparatus comprises a vacuum chamber inside which there is disposed an induction melting furnace, a mold preheating furnace with a ceramic mold, a drive assembly for mold transportation and a water-cooled tank. The drive assembly comprises a rod on which the mold is fixed with the help of a hanger and a regulating actuator for vertical movement being positioned above the vacuum chamber. The water-cooled tank is shaped as a truncated cone. The tank upper portion is opened towards the heating zone, and its bottom portion has a smaller base

than the upper portion. A baffle separates the heating zone inside the induction furnace from the cooling zone. The baffle moves in a horizontal plane and closely adjoins the mold during the solidification process. The baffle consists of the segments or sectors (not less than 2 from each side). --

Please replace the paragraph beginning at page 3, line 17, with the following rewritten paragraph:

-- Figs. 1 and 2 show a schematic drawing of the apparatus where 1 is a ceramic mold, 2 is a hanger to fix the mold to a drive assembly, 3 is a rod, 4 is a heater of a mold preheating furnace, 5 is a heat baffle, 6 is a water cooled tank, 7 is a molten superalloy, and 8 is a starting zone with a seed. --

Please replace the paragraph beginning at page 4, line 21, with the following rewritten paragraph:

-- In another aspect of this invention, in order to produce blades having single crystal structure with desired orientation, a single crystal seed with proper orientation is positioned into the top of the starting zone (8) of the ceramic mold before it is disposed in the vacuum chamber. Then the mold position is strictly fixed relative to the heater. In such event the seed and the solidified portion of the starting zone serve as a cooling medium, and further solidification of the melt is caused by radiation cooling in the water-cooled tank as stated above. The use of the water-cooled tank instead of a chill plate allows the same or better working efficiency of the tank than that of a chill plate or of the circular water-cooled cavity. At the same time the water-cooled tank of this embodiment of the invention does not require the use of a complex drive assembly with airtight seals. --

Please replace the paragraph beginning at page 5, line 13, with the following rewritten paragraph.

-- The embodiments of the apparatus and method of this invention allows one to produce high quality castings having the directional and single crystal structure, including the large sized castings used, for example, in the land based turbine industry, by the method of radiation cooling without using the crystallizers of the prior art. The embodiments of the invention also gives the possibility to reconstruct easily the disclosed apparatus for liquid metal cooling crystallization processing, to use successively the water-cooled tank as a mold catch basin in the event of mold breakage, and to increase the reliability and economic profitability of the apparatus' performance --

Please add the following new paragraph beginning at page 5, line 23:

-- One skilled in the art may make various modifications in the manner and/or structure and/or steps and/or way and/or function and equivalents thereof of the disclosed embodiments without departing from the scope and extent of the invention. --

IN THE CLAIMS

Please cancel claims 1 to 8 and 11 to 14.

Please amend claim 9 as follows:

9 (amended). A method of making a metal casting comprising the steps of:

- a. placing a mold in a mold furnace having a heater;
- b. heating the mold to a temperature of about 100 to 150 °C above a liquidus temperature of a casting alloy;